Demonstration of direct air capture (DAC) of CO_2 with building air handling equipment

FEAA375

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Direct Air Capture Kickoff Meeting

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Program Overview

Timeline:

Start date: October 2020

Planned end date: October 2022

Key Milestones

1. Preliminary feasibility analysis (October 2021)
2. Demonstration of scalable system(October 2022)

Budget:

DOE: $1,500,000

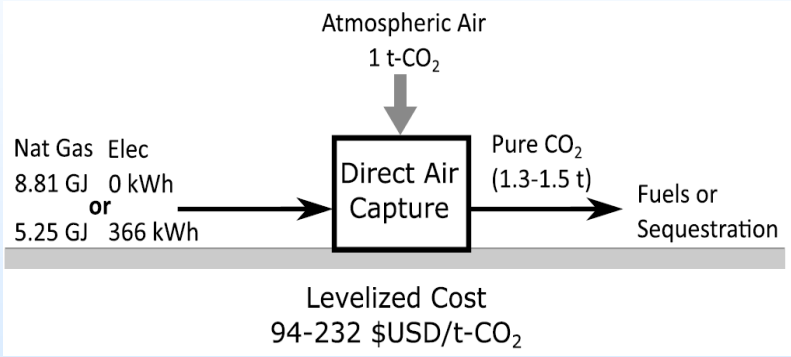
OAK RIDGE National Laboratory

Building Technologies and Research Integration Center (BTRIC)

Project Objectives:

- Preliminary assessment of HVAC systems to accommodate DAC
- Development of appropriate materials and system design
- Demonstration of direct air capture using existing building equipment
- Quantification of the techno-economic impact

Technology Background



Levelized costs of \$94 to \$232 per ton CO_2 from the atmosphere

- Centralized DAC is an expensive technology
  - Logistics support (infrastructure)
  - Air movers (blowers)
  - Regeneration (heat, mechanical energy)
- There are over 120 Million buildings across the US
- Air handling infrastructure can enable a distributed DAC

Technology Background

Centralized

Distributed

- Develop a highly modular and scalable technology for CO_2 capture
- Distributed deployment with minimal cost (capital and operation)
- Deployment issues (integration, control, etc.)
- Compatible materials development

Technical Approach

Materials development and characterization

Air handler design analysis and modification

Process Control & Integration

Team and Facilities


Kashif Nawaz


Brian Fricke


Moonis Ally


Costas Tsouris


Yarom Polsky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Jamieson Brechtl


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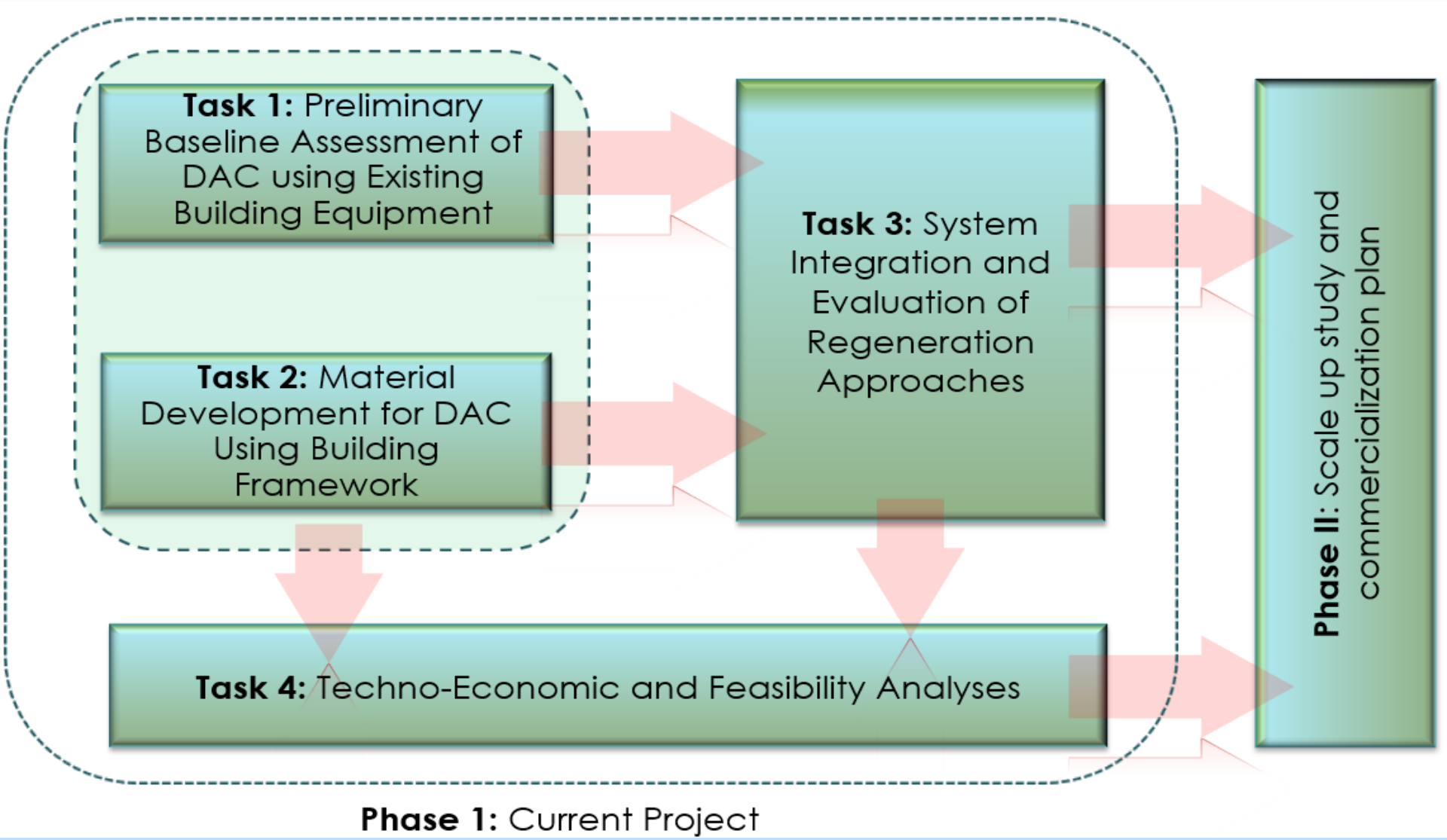
Michelle Kidder


Josh Thompson


Chris Janke

- Building equipment design and demonstration
- Materials development and characterization
- Process control and optimization
- Heat and mass transfer

Progress and Current Status of Project



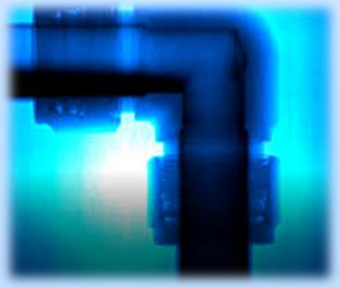
Opportunities for Collaboration

Materials characterization

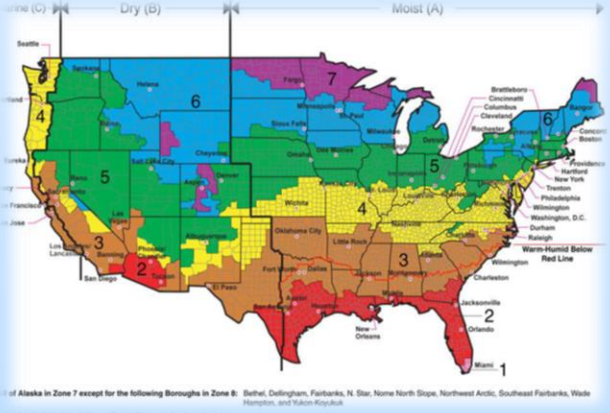
Contactor performance evaluation

Additive manufacturing

Advanced computation



Advanced visualization



National climate data

DAC performance in various climate zones
(temperature, relative humidity, CO_2 concentration)

Opportunities for Collaboration

- Impact of climate conditions on DAC solutions
- Contractor design and performance evaluation
- Process modeling, steady state and transient operation
- Contactor manufacturing
- Materials characterization
- System integration and process control
- Scale-up performance evaluation, demonstration
- Commercialization support
- Process integration

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